CoAP usages for Device Management

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OMADM - Lightweight M2M
draft-jimenez-t2trg-coap-functionality-lwm2m

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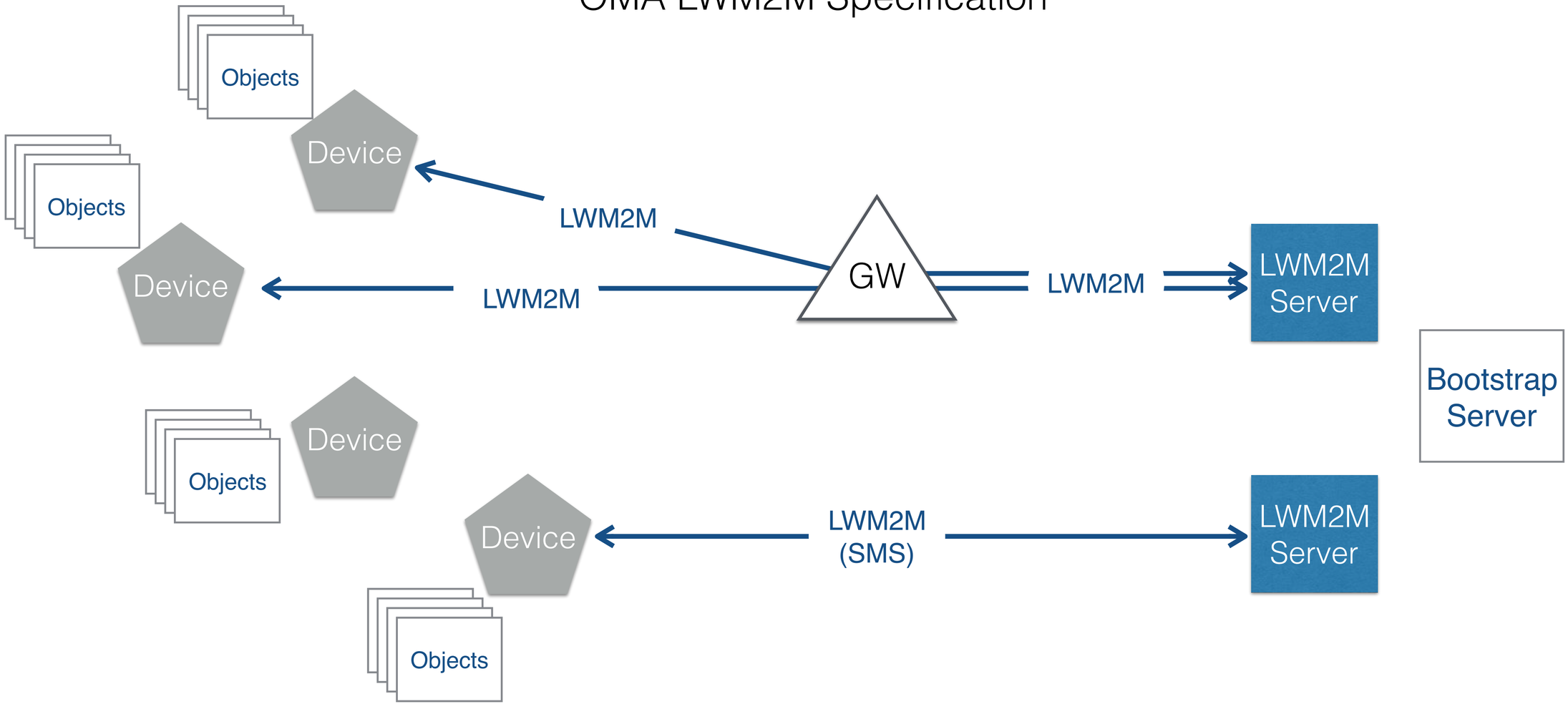
ERICSSON

LWM2M Interactions

OMA LWM2M Specification



Possible LWM2M Additions

1. **Device and Manager configuration.**

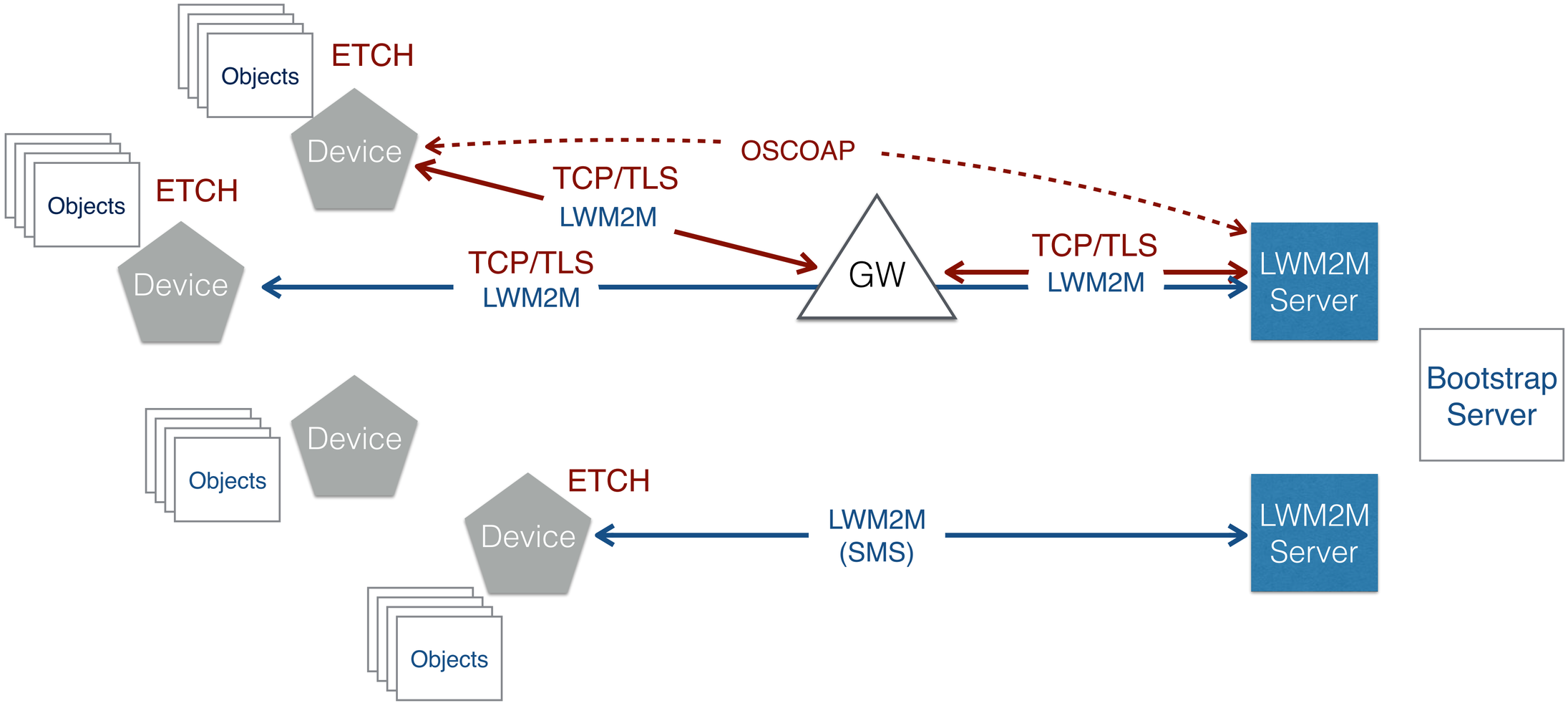
   Currently covered by LWM2M.

- *[I-D.ietf-core-coap-tcp-tls]* outlines the changes required to use CoAP over TCP, TLS, and WebSockets transports. Soon to start RFC process.

- *[I-D.ietf-core-object-security]* For systems in which endpoints work behind a gateway or use LWM2M for managing the gateways, it might be good to implement other types of cryptographic protection than TLS/DTLS.

- *[I-D.ietf-core-etch]* Support for features like PATCH/FETCH could be greatly beneficial for things like firmware upgrade or observing relatively large sets of resources.

Possible LWM2M Additions



Possible LWM2M Additions

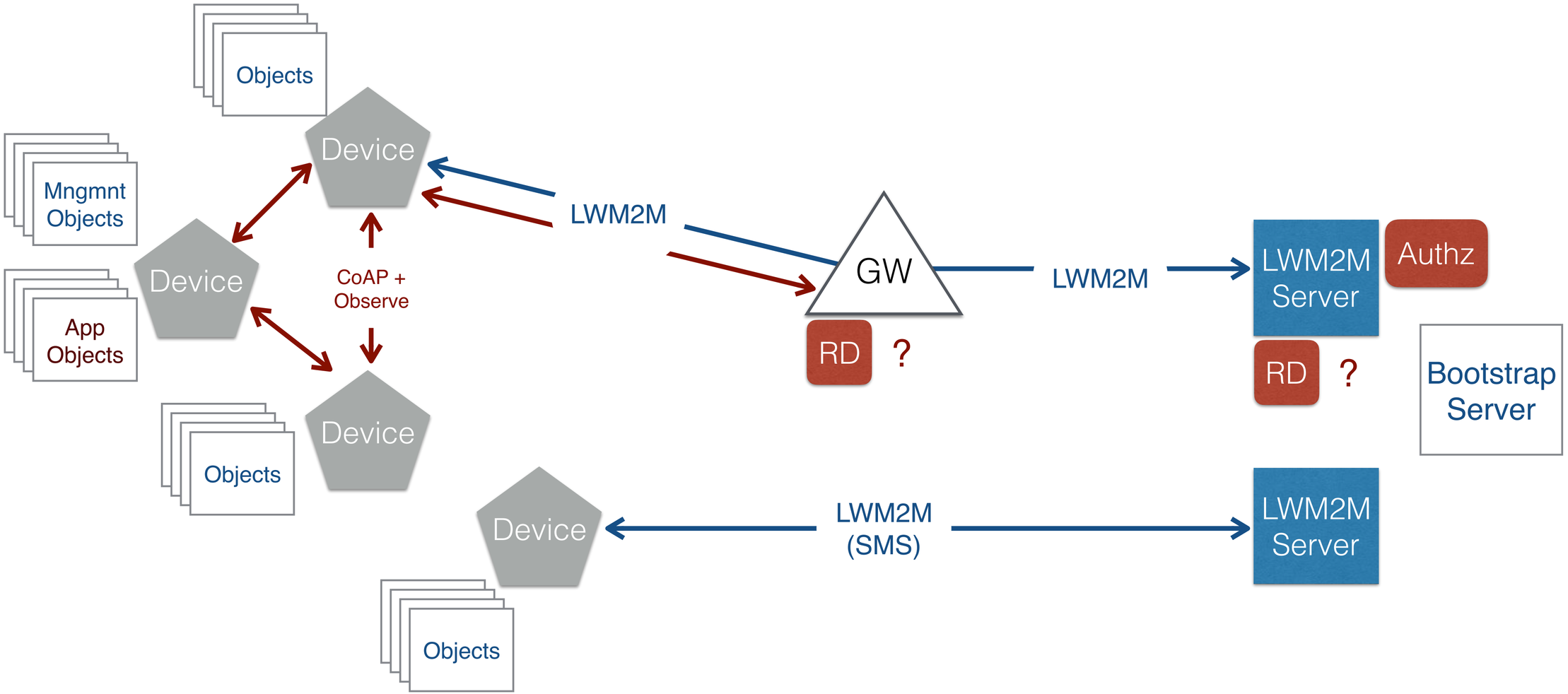
2. Device to Device configuration.

- *[I-D.ietf-core-resource-directory]* CoAP's in-built discovery would be beneficial to support cases in which devices talk to each or in which a more autonomous management approach is preferred. For now devices under the same subnet can use IP multicast as expressed on [RFC7390] and through /.well-known/core.

  Devices would support CoAP Observe [RFC7641] between each other in order to subscribe to updates from one another.

- *[I-D.ietf-ace-oauth-authz]* could be used as security framework and the LWM2M Server would act as Authorization Server.

Possible LWM2M Additions



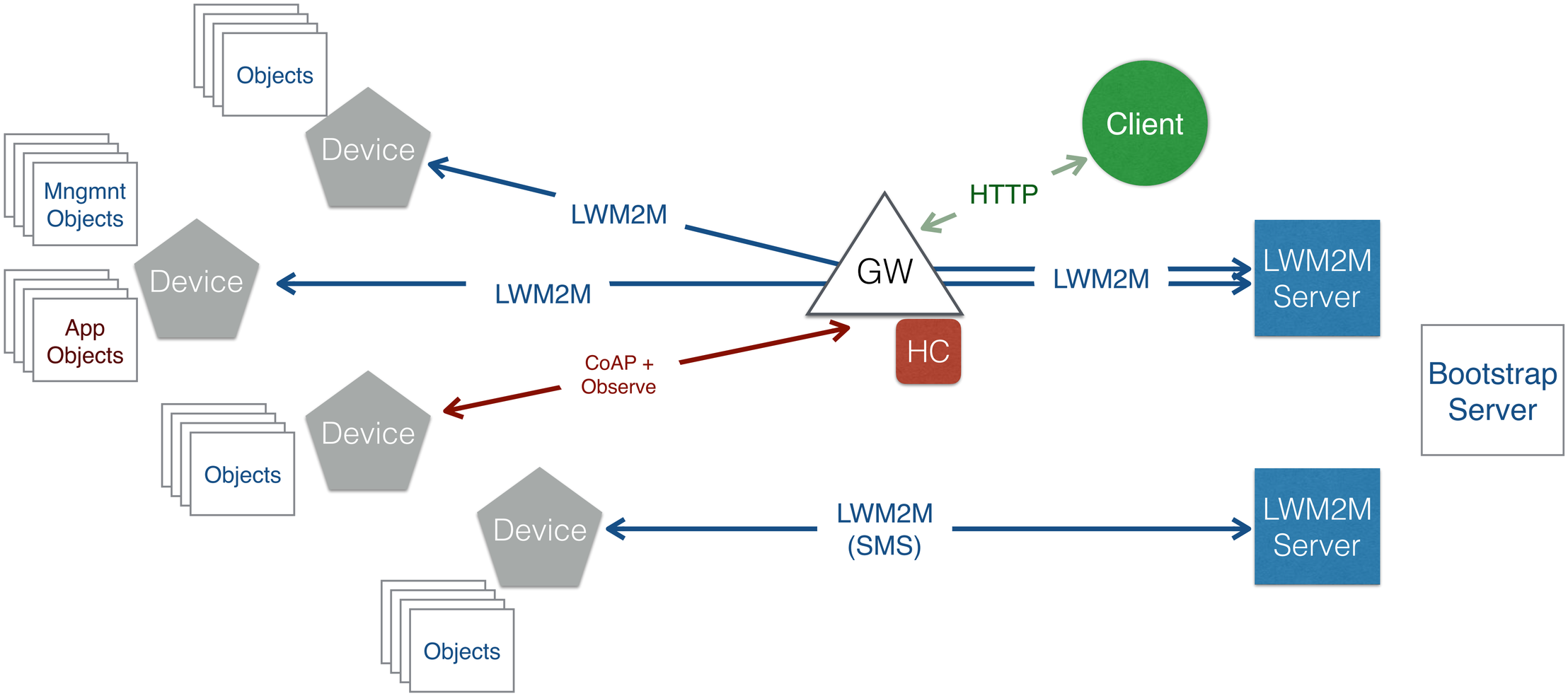
Possible LWM2M Additions

3. **Device to Application configuration.**

Including the aforementioned on (1) and (2).

[I-D.ietf-core-http-mapping] in cases of phone talking to GW. GW should implement a HC proxy.

Possible LWM2M Additions



LWM2M Data Model

- [RFC6690] Web Linking. ObjectLinks (String<ObjectID:InstanceID>) are not sufficient to represent links between devices or applications.

- Use unique ResourceIDs and register them to consistently use the same identifiers for the same resources.

- Update the serialization format [RFC7049]. JSON can be greatly compressed to CBOR format.

- A lot of work has happened on the Data Model space, perhaps it is time to revisit the Object Model. [IOTSI]

Concrete additions to LWM2M

Specify support for:

- *[I-D.ietf-core-etch]* Support for features like PATCH/FETCH could be greatly beneficial for things like firmware upgrade or observing relatively large sets of resources.

- *[I-D.ietf-core-object-security]* For systems in which endpoints work behind a gateway or use LWM2M for managing the gateways, it might be good to implement other types of cryptographic protection than TLS/DTLS.

- [RFC6690] Web Linking. Need to specify new Resource Type as hyperlink.

- Use unique ResourceIDs and register them to consistently use the same identifiers for the same resources.

- Update the serialization format [RFC7049]. JSON can be greatly compressed to CBOR format.

ietf-core-etch

Specified by IETF - CoRE Working Group.

Status: Soon to be RFC. Several implementations available.

Abstract: Adds three new CoAP methods, FETCH, to perform the equivalent of a GET with a request body; and the twin methods PATCH and iPATCH, to perform partial modifications of an existing CoAP resource.

Advantages: Existing CoAP methods only allow access to a complete resource. This does not permit applications to access parts of a resource. In LWM2M there are often cases in which applications need to access larger or more complex data, or observe larger resources. Replacing or requesting the whole resource is undesirable.

Link: https://tools.ietf.org/html/draft-ietf-core-etch

ietf-core-object-security

Specified by IETF - CoRE Working Group.

Status: Reaching maturity stage. Several implementations available. Interop event in February. Used in other Working Groups (6LoWPAN).

Abstract: …

Advantages: Matches well REST architecture and payload-based security.

Link: https://tools.ietf.org/html/draft-ietf-core-object-security

RFC5988 and RFC6690 - Web Linking.

Need for Web Linking and CoreLink format.

Status: IETF Standards. Web Linking is needed to create hypermedia applications. CoRE Link is already part of OMA LWM2M but, to my knowledge, it does not use Web links as expressed in RFC5988 rather just Object links.

Abstract: Web Linking (RFC5988) provides a way to represent links between Web resources as well as the relations expressed by them and attributes of such a link. In constrained networks, a collection of Web links can be exchanged in the CoRE link format (RFC6690). Web linking is necessary to create Resources that link to Resources hosted in other CoAP Endpoints.

Need to find the appropriate guide developers. **1)** New Data Type? Currently LWM2M defines String, Integer, Float, Boolean, Opaque, Time, Objlink. **2)** A new Object with a URL in String format as mandatory Resource. **3) ?**

Advantages: With Web Linking a CoAP Endpoint can tell a LWM2M server where to fetch resources from or where to get extra information not hosted in the device. Endpoints can also link to other, similar devices. It enables interoperability and discovery of new applications and services.

Link: https://tools.ietf.org/html/rfc5988, https://tools.ietf.org/html/rfc6690 , Appendix “C” of OMA TS.

Reusable Resource IDs for LWM2M Objects

Specified by OMA LWM2M and IPSO Smart Objects.

Status: Needed to enable Object Composition and Reusable Resources.

Abstract: OMA D.2.2. defines the creation of a Resource Registry. It is currently being used by IPSO, OneM2M and other SDOs for Application Specific Objects. However LWM2M Objects' Resources do not belong to such Registry, instead their Resource IDs always fall in the [0..10] range. It would make sense to be consistent.

Advantages: By using the concept of "mandatory" and "optional" resources, as well as proper Resource IDs companies can keep the same interoperable Object Model but adding composition. It also allows to align the Object Model design across participant SDOs.

Link: http://ipso-alliance.github.io/pub

RFC7049 CBOR - Data Format

Specified by IETF - CoRE Working Group.

Status: IETF Standard RFC7049 Concise Binary Object Representation (CBOR).

Abstract: CBOR is a binary data format which has been optimised for data exchange for the Internet of Things (IoT).

Advantages: For many IoT scenarios, CBOR formats will be preferred since it can help decrease transmission payload sizes as well as implementation code sizes compared to other data formats.

Link: https://tools.ietf.org/html/rfc7049

Assorted References

REST	https://www.ics.uci.edu/~fielding/pubs/dissertation/rest_arch_style.htm
CoAP	https://tools.ietf.org/html/rfc7252
CoRE Link-Format	https://tools.ietf.org/html/rfc6690
CoAP Observe	https://tools.ietf.org/html/rfc7641
CBOR	https://tools.ietf.org/html/rfc7049
IOTSI	https://www.iab.org/activities/workshops/iotsi/
IOTSU	https://www.iab.org/activities/workshops/iotsu/
CoRE RD	https://datatracker.ietf.org/doc/draft-ietf-core-resource-directory/
LWM2M	https://github.com/OpenMobileAlliance/
CoMI	https://tools.ietf.org/wg/core/draft-ietf-core-yang-cbor/
CoAP-SNMP Interworking	https://tutcris.tut.fi/portal/files/1076133/lindholm_ventola_coap_snmp_interworking.pdf
CoAP TCP+TLS	https://tools.ietf.org/wg/core/draft-ietf-core-coap-tcp-tls/
IPSO	http://ipso-alliance.github.io/pub/
LWM2M to YANG	https://tools.ietf.org/html/draft-vanderstok-core-yang-lwm2m-00
OSCOAP	https://tools.ietf.org/wg/core/draft-ietf-core-object-security/
CoAP for LWM2M	https://tools.ietf.org/html/draft-jimenez-t2trg-coap-functionality-lwm2m